

One-Page On-Site Troubleshooting Card for Sulfolane

Core Control Red Lines (Check First; 80% of Failures Caused by Over-Limit Indexes)

1. Temperature Red Line: Long-term operation $\leq 220^{\circ}\text{C}$; local temperature exceeding 230°C prohibited; storage/tracing heat constant temperature $30\text{--}40^{\circ}\text{C}$ (anti-crystallization)
2. Oxygen Content Red Line: System full nitrogen blanketing $\leq 0.05\%$; air ingress causes blackening and degradation
3. Water Content Red Line:
Aromatic Extraction: $0.5\%\text{--}2.5\%$; Polymer/Pharmaceutical Grade: $\leq 50\text{ppm}$; Lithium Battery Electronic Grade: $\leq 10\text{ppm}$
4. Acid Value Red Line: Normal $< 0.3\text{mgKOH/g}$; regenerate via deacidification immediately if > 0.5

I. General Rapid Troubleshooting for All Industries

表格

On-Site Phenomenon	Priority Test Items	Root Cause	Emergency On-Site Treatment
Solvent turns yellow/brown-black, frequent filter blockage, gum deposits on kettle walls	Acid value, oxygen content, reboiler wall temperature	Oxygen ingress oxidation / local over-temperature decomposition producing sulfonic acid gum	1. Supplement full nitrogen blanketing for the whole system; 2. Add MEA for neutralization; 3. Activate online filtration; 4. Offline rectification for solvent with excessive acid value
Pitting corrosion on carbon steel pipelines, heat exchanger leakage, elevated sulfate in circulating water	pH value, corrosion inhibitor concentration, system water content	Continuous corrosion by degraded acidic substances	1. Increase imidazoline corrosion inhibitor dosage; 2. Resin deacidification; 3. Rectification regeneration for over-limit solvent
Pipeline flow drops in winter, pump cavitation,	Tracing heat temperature, storage tank	Crystallization and solidification below 27.4°C	1. Raise tracing heat temperature to 35°C ; 2. Continuous small circulation of storage

On-Site Phenomenon	Priority Test Items	Root Cause	Emergency On-Site Treatment
white crystal blockage in filters	circulation pump operating status		tank; 3. Melt blocked pipes slowly with low-pressure steam, rapid heating forbidden
Sharply increased monthly sulfolane consumption, severe solvent loss	Condensate water temperature, water washing flow rate, pump mechanical seals leakage	Uncondensed gas phase / entrainment in water washing / equipment leakage	1. Lower cooling water temperature; 2. Upgrade multi-stage countercurrent water washing; 3. Inspect and repair flanges and seals; 4. Install tail gas adsorption recovery device
Severe foaming in system, violent liquid level fluctuation, tower flooding with entrainment	Solvent colority, water content fluctuation, defoamer inventory	Gum impurities / fluctuating water content / insufficient defoamer	1. Add silicone defoamer at 0.05–0.1kg per ton of solvent; 2. Filter to remove gums; 3. Reduce tower load

II. Industry-Specific Quick Troubleshooting Guide

1. Aromatic Extraction Units

- Excessive aromatics in raffinate oil, insufficient BTX purity
Test Items: Solvent-oil ratio, system water content, solvent colority
Root Cause: Solvent degradation / water content >3% / solvent-oil ratio <2.8:1
Treatment: Adjust solvent-oil ratio to 3.2–3.8:1; rectify to remove excess water; regenerate black degraded solvent
- Frequent acid washing of solvent system, scaling on heat exchangers
Test Items: Feed olefin content, chloride ion content
Treatment: Front-end hydrogenation to control olefin <0.5%, feed Cl⁻ <1ppm

2. Sulfolane-MDEA Desulfurization Stations

- Excessive organic sulfur (mercaptan/thiophene) in purified gas
Test Items: Sulfolane proportion, lean solution temperature, regeneration temperature
Root Cause: Sulfolane proportion <25%, incomplete regeneration

Treatment: Adjust standard formula: 30% sulfolane + 40% MDEA + 30% water; regenerate at 110–130°C for full desorption

2. Black amine solution, packing blockage

Treatment: Continuous side-stream filtration; strictly control oxygen ingress

3. PEEK/PI High-Temperature Polymerization Production Lines

1. Unstable resin molecular weight, insufficient mechanical strength

Test Items: Sulfolane water content, kettle oxygen content, metal impurities

Root Cause: Water hydrolyzes monomers / oxygen oxidizes phenoxide salts

Treatment: Pre-dehydrate solvent to <50ppm; nitrogen purge kettle to oxygen <10ppm; maximum polymerization temperature $\leq 250^{\circ}\text{C}$

2. Excessive residual sulfolane in finished products

Treatment: 3-stage countercurrent water washing at 80–95°C, rectify and recover solvent from washing water

4. Lithium Battery Electrolyte (Special Electronic Grade)

1. Electrolyte gas generation, high-temperature cell swelling

Test Items: Sulfolane water content, heavy metal ions (Na/Fe/Ca)

Root Cause: Water >15ppm, excessive metal ions catalyze decomposition

Treatment: Replace with electronic grade sulfolane (water $\leq 10\text{ppm}$, metal ions $\leq 1\text{ppb}$); closed compounding workshop with dew point $\leq -40^{\circ}\text{C}$

2. Fast cycle attenuation of high-voltage batteries

Treatment: Control sulfolane dosage at 5%–12%, compound with VC/FEC film-forming additives

5. Fine Pharmaceutical Synthesis

1. Declined intermediate yield, increased impurities

Test Items: Circulating solvent acid value, water content

Treatment: Regular rectification to remove acidic heavy fractions; full nitrogen protection throughout process

2. Excessive solvent residue in finished products failing export pharmacopoeia standards

Treatment: Recrystallization with hot water/methanol; centralized recovery of solvent from mother liquor

III. Minimal Daily Inspection Checklist (5 Minutes Per Shift)

1. Visual Inspection: Solvent color, crystallization, foaming, leakage

2. Temperature Measurement: Storage tank tracing heat, reboiler, extraction/absorption tower temperature
3. Laboratory Test (Per Shift): Water content, pH/acid value
4. Equipment Check: Nitrogen blanketing pressure, circulation pumps, filter pressure difference, defoamer/corrosion inhibitor liquid level

IV. Long-Term Prevention Mnemonic

Control oxygen via nitrogen blanketing, temperature below 220°C; strictly limit water content, regular deacidification & rectification; winter thermal insulation, multi-stage water washing to reduce solvent loss.